transport arm transports substrates into and out of each of the three substrate holding areas.

27. A method as in Claim 5, wherein the substrate on the end effector is transported into and out of the substrate holding area along a first path, the method further comprising the steps of releasing the substrate from the end effector and returning the end effector without the substrate into and out of the substrate holding area along a second path, which second path is shorter than the first path.

REMARKS

This is in response to the Office Action mailed 11/26/99 (Paper no. 3). Claims 5, 8, 15-18, 19 and 23 have been amended above. Claims 24-27 have been added. Claims 1-27 are now pending in this application.

In paragraph 2 of the Office Action, the Examiner rejected Claims 1-3, 5, 8-14, and 16-21 under 35 U.S.C. 102 as being anticipated by Fukasawa et al. (hereinafter Fukasawa). The Applicant respectfully disagrees.

Claim 1 recites that the step of moving the transport arm (to radially displace the wrist of the arm relative to the shoulder) rotates the end effector about the wrist to rotate the substrate (on the end effector) about the axis of rotation at the shoulder in concert with rotation of the wrist about the axis of rotation at the shoulder.

Clearly, Fukasawa does not anticipate the invention recited in Claim 1. In Figs. 1 and 2, Fukasawa discloses a convey chamber 2, with a multi-joint arm member 5 within for

conveying wafers between cassette chambers 3a and 3b, and vacuum process chambers 4a-4c. In Figs. 3 and 4, Fukasawa discloses that multi-joint arm member 5 has three arms 51,52,53 which are independently pivoted (col. 6, lines 40-46). In particular, Fukasawa discloses that drive unit 6 drives the multi-joint arm member 5 via multi-shaft 61 (see Fig. 4). The drive unit has three motors (col. 6, lines 49-55). Each motor independently drives a corresponding one of the arms 51-53 (col. 7, lines 5-8). For example, upper convey arm 53 is independently pivoted by one motor via pivot shaft 53a and a transmission mechanism. Intermediate arm 52 is independently pivoted by a second one of the motors, and lower arm 51 is independently pivoted by the third one of the motors. Clearly then, pivoting of the lower and intermediate arms 51,52 in Fukasawa will not cause the upper arm 53, which is independently pivotable, to be pivoted about pivot shaft 53a. Upper arm 53 in Fukasawa simply cannot be pivoted about shaft 53a by moving arms 51,52. The multi-joint arm member 5 is moved to radially displace the pivot shaft 53a (i.e. wrist) relative to the shaft 61 (i.e. shoulder) by independently rotating the lower arm 51 and independently rotating intermediate arm 52. This however, as noted above, does not rotate the upper arm 53 about the wrist (i.e. pivot shaft 53a) because rotation of arms 51,52 simply cannot effect rotation of the upper arm 53. By comparison, Claim 1 recites that moving the transport arm rotates the end effector about the wrist. Fukasawa clearly does not disclose this. Upper arm 53 of the multi-joint arm member 5, in Fukasawa, is independently pivoted about shaft 53a, and moving multi-joint member 5 simply would not cause the upper arm 53 to be pivoted about shaft 53a. Fukasawa clearly does not disclose that moving the transport arm rotates the end effector about the wrist to rotate the substrate about the axis of rotation at the

shoulder in concert with rotation of the wrist about the axis of rotation at the shoulder. Claims 1-4 are patentable over the cited prior art and should be allowed.

Claim 5 recites that movement of the end effector (radially displacing the end effector relative to the axis of rotation) complements rotation of the transport arm about the axis of rotation to result in the substrate being substantially rectilinearly translated in and out of the holding area.

Fukasawa does not anticipate the invention recited in Claim 5. It is not seen where in Fukasawa it is disclosed that, radial movement of upper convey arm 53 (i.e. the end effector) complements rotation of the multi-joint arm member 5 to result in a wafer W on arm 53 being substantially rectilinearly translated in and out of a chamber 3-4. In col. 10, lines 36-43, Fukasawa discloses that multi-joint arm member 5, with independently pivotable arms 53-51 has a high degree of freedom. Fukasawa, also discloses that the convey path for a wafer W conveyed by arms 53-51 can be freely selected within the stroke range of each arm. Nevertheless, the mere capability of freely selecting the convey path of wafer W conveyed by the multi-joint member 5 with independently pivotable arms in Fukasawa, is not the same as having the movement radially displacing the end effector complement the rotation of the transport arm to result in the substrate being rectilinearly translated in and out of a holding area. Fukasawa simply does not disclose that the movement of the end effector complements rotation of the transport arm to result in the substrate being rectilinearly translated as called for in Claim 5. Nor does it necessarily arise from the disclosure in Fukasawa of a multi-joint arm member 5 with independently

pivoted arms 53-51 which conveys wafer W along a freely selectable convey path, that the radio movement of upper arm 53 complements the rotation of the multi-joint member 5 to result in the wafer W being rectilinearly translated in and out of a chamber 3. By way of example, it appears from Fig. 2 that to convey wafer W to or from chambers 4a-4b, arms 51,52 are independently pivoted to move arm 53 radially, and that arm 53 is independently pivoted about shaft 53a (see also Fig. 4) to convey the wafer W to/from the chambers. In this case, there appears to be no rotation required of the multi-joint member 5 as a unit. Hence, radial movement of arm 53 in Fukasawa, clearly cannot complement rotation of member 5 because member 5 does not appear to rotate when conveying wafers to chambers 4a-4b. Fukasawa simply does not disclose that movement of the end effector complements rotation of the transport arm to result in the substrate being rectilinearly translated in and out of the holding area. Claim 5 is patentable over the cited prior art and should be allowed.

Claim 8 recites that the rotation of the end effector about the wrist (of the transport arm) is slaved to the substrate transport arm, and that the robot transport arm is adapted to transport substrates into and out of three general side by side orientated substrate holding areas.

Fukasawa clearly does not anticipate the invention recited in Claim 8. As noted previously with reference to Claim 1, in Figs. 3 and 4, Fukasawa discloses that each arm 51-53 of the multi-joint arm member 5 is independently pivotable about a corresponding pivot shaft 61,52a,53a (col. 6, line 43). Hence, the rotation of upper arm 53 holding wafer W about shaft 53a is independent from the multi-joint arm member 5 (the arm 53 is pivoted by an independent motor).

By comparison, Claim 8 recites that the rotation of the end effector about the wrist is slaved to the transport arm. Nowhere does Fukasawa disclose this. On the contrary, Fukasawa discloses that the upper arm 53 is rotated independently from the multi-joint arm member 5. Claims 8-18 are patentable over the cited prior art and should be allowed.

Claim 19 calls for the controller being programmed to control the transport arm for moving substrates into an out of at least two side by side substrate storage areas along axes of translation corresponding to each of the two storage areas, and for moving the end effector without substrates into and out of at least one of the two storage areas along a different path than the axis of translation of the storage area, wherein the end effector is slaved to the robot transport arm to rotate automatically about the wrist when the transport arm moves.

Fukasawa clearly does not anticipate the invention recited in Claim 19. As noted with reference to Claims 1 and 8, Fukasawa discloses that upper arm 53 (which holds the wafer W on multi-joint member 5) is independently pivotable about shaft 53a (i.e. the wrist). The upper arm 53 is simply not slaved to the transport arm to rotate automatically about the wrist when the transport arm moves. In sharp contrast, Claim 19 recites that the end effector is slaved to the transport arm to rotate automatically about the wrist when the transport arm moves. Claims 19-22 are clearly patentable over the cited prior art and should be allowed.

In paragraph 4 of the Office Action, the Examiner has rejected Claims 4, 6-7, 15, 22, and 23 under 35 U.S.C. 103 as being unpatentable over Fukasawa in view of Bacchi et al. (hereinafter Bacchi). The Applicant respectfully disagrees.

Claim 6 calls for moving the end effector along a first path to axially translate a substrate along the first path through an opening of the substrate holding chamber, and returning the end effector through the opening along a second path, a portion of the second path extending through the opening being different than a comparable portion of the first path through the opening.

Neither Fukasawa nor Bacchi disclose or suggest the features recited in Claim 6. In col. 10, lines 40-43, Fukasawa merely discloses that the convey path for wafer W conveyed by convey arms 53-51 can be freely selected within the stroke range of the arm. Fukasawa, however, does not disclose or suggest that the arms 53-51 convey the wafer W along one path, and return along a different path. Nowhere does Fukasawa disclose or suggest that the conveyed path of wafer W is different than the return path of upper arm 53. By comparison, Claim 6 recites that the end effector moves along a first path to translate a substrate along the first path through an opening of the substrate holding chamber, and returns through the opening along a second path different than the first path. Claim 6 clearly reads over Fukasawa.

In Fig. 6, Bacchi discloses move profiles of hand 30 for retrieving wafers from cassettes 168l and 168r. Nowhere does Bacchi disclose or suggest that the move profiles move the hand 30 along one path to retrieve wafers from the cassettes 168l,168r, and return the hand along a different path. On the contrary, in Fig. 10 Bacchi discloses that hand 230 moves wafers in/out of cassette 353 and returns along the same path through the opening of the cassette. By comparison, Claim 6 calls for moving the end effector along a first path to actually translate a substrate along the

first path though the opening of the cassette, and for returning the end effector through the opening along a second path different than the first path. This is simply not disclosed or suggest in Bacchi. Combining Fukasawa and Bacchi would still not provide the features recited in Claim 6, because neither Fukasawa nor Bacchi disclose or suggest these features and the combination of Fukasawa and Bacchi cannot provide features not disclosed or suggested in either reference. The Examiner appears to agree with this in paragraph 4 of the Office Action.

Moreover the Applicants note that, it would not have been obvious for a person skilled in the art, as a matter of choice, to modify the combination of Fukasawa and Bacchi so that the end effector is moved along a first path to axially translate the substrate along the first path through the opening of the cassette and is returned through the opening along a different path as otherwise called for in Claim 6. This feature of Claim 6 is shown in Figs. 2a-2c, and 3a-3c of the instant application (copies of which have been attached hereto for the convenience of the Examiner). The figures clearly illustrate that moving the end effector along a first path when transporting a substrate, and returning along a different path as in the instant invention is not merely a matter of design choice. The different return path of the end effector is significantly shorter (i.e. cuts the corner) than the first path transporting the substrate in/out of the cassette. The shorter path can be completed faster than if the end effector moved along the same path when moving substrates and when returning. Hence, the through-put of substrate transport apparatus incorporating features of the instant invention is increased thereby resulting in a cost reduction for manufacturing substrates in comparison to apparatus using the combination

of Fukasawa and Bacchi. Nowhere does Fukasawa, or Bacchi disclose or suggest that moving the end effector along one path to transport substrates through the opening of cassettes but returning along a different path through the opening as in the instant invention would effect an increase in the through-put of the substrate transport apparatus. Nor would this be obvious to a person of skill in the art from the disclosure of Fukasawa or Bacchi without more. In fact, in Fig. 10 Bacchi discloses that the hand 230 moves the wafers into cassettes 353 and returns along the same path. Thus, Bacchi would suggest to a person skilled in the art that the path of the end effector should be the same when conveying wafers and returning. Accordingly, it would not have been obvious for a person skilled in the art without more to modify the combination of Fukasawa and Bacchi so that the end effector is moved along a first path for transporting substrates, and is returned along a different path as otherwise called for in Claim 6. Claims 6-7 are patentable over the cited prior art and should be allowed. Similarly, Claim 23 is also patentable over the cited prior art and should be allowed.

Enclosed is a check in the amount of $72.00 as payment for adding 4 claims. Please charge deposit account 16-1350 for any fee deficiencies arising from the filing of this Amendment.

For all of the foregoing reasons, it is respectfully submitted that all of the claims now present are clearly novel and patentable over the prior art of record. Accordingly, favorable reconsideration and allowance is respectfully requested. Should any unresolved issue remain, the Examiner is invited to call Applicant's Attorney at the

telephone number indicated below.

Respectfully submitted,

J. M

2/29/00

Janik Marcovici (Reg. No. 42,841) Date

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Name of Person Making Deposit

FIG. 2A

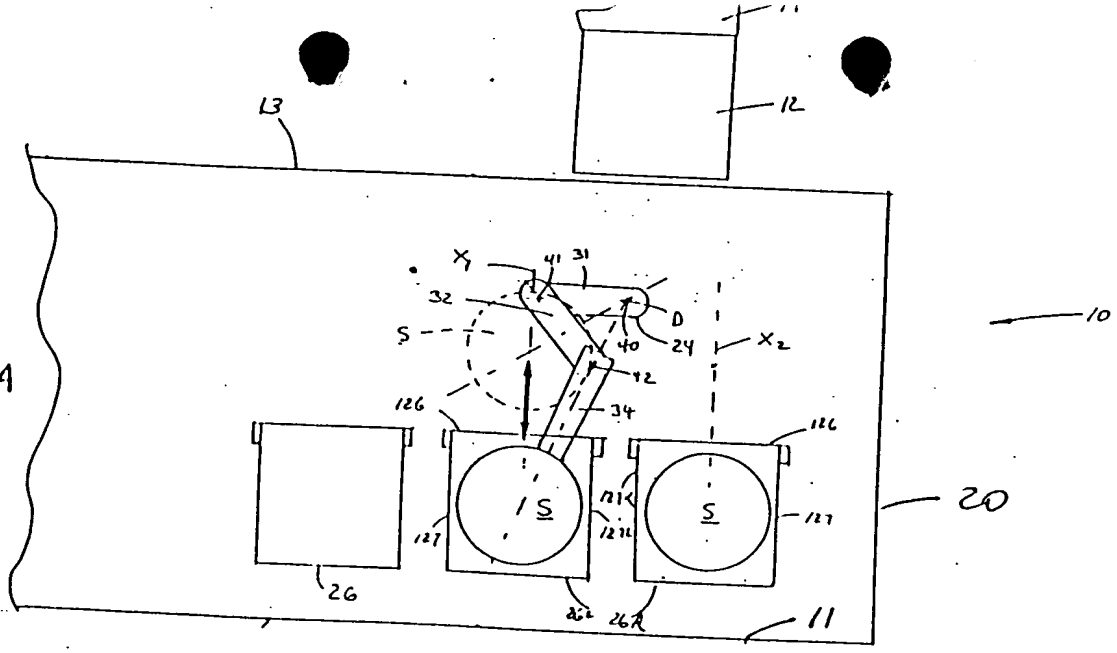

FIG. 2B

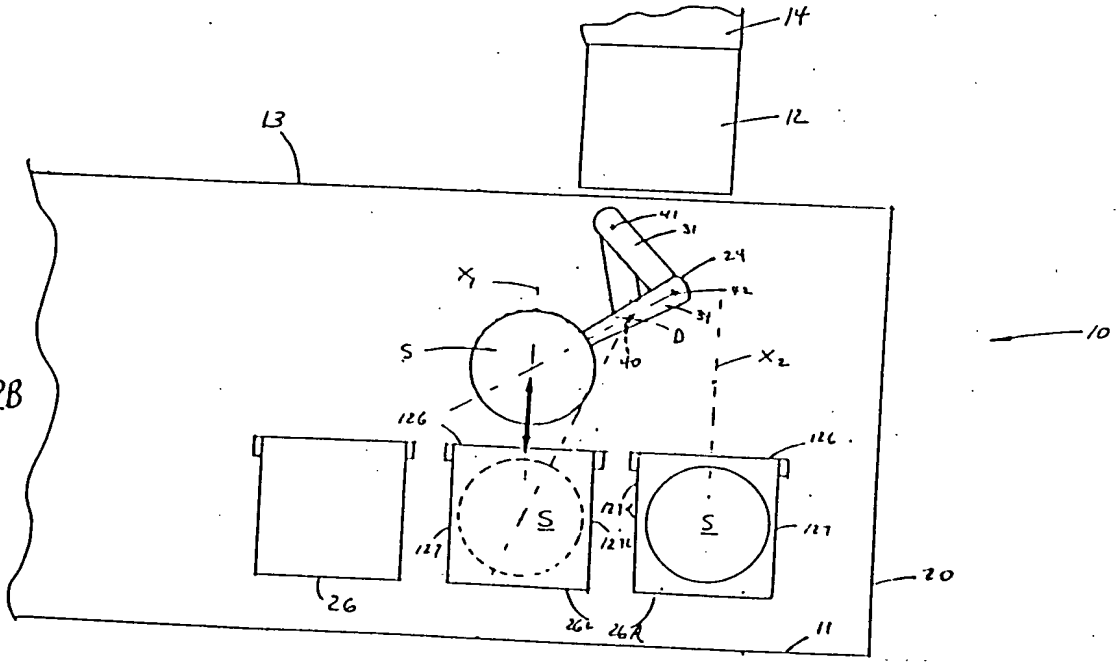

FIG. 2C

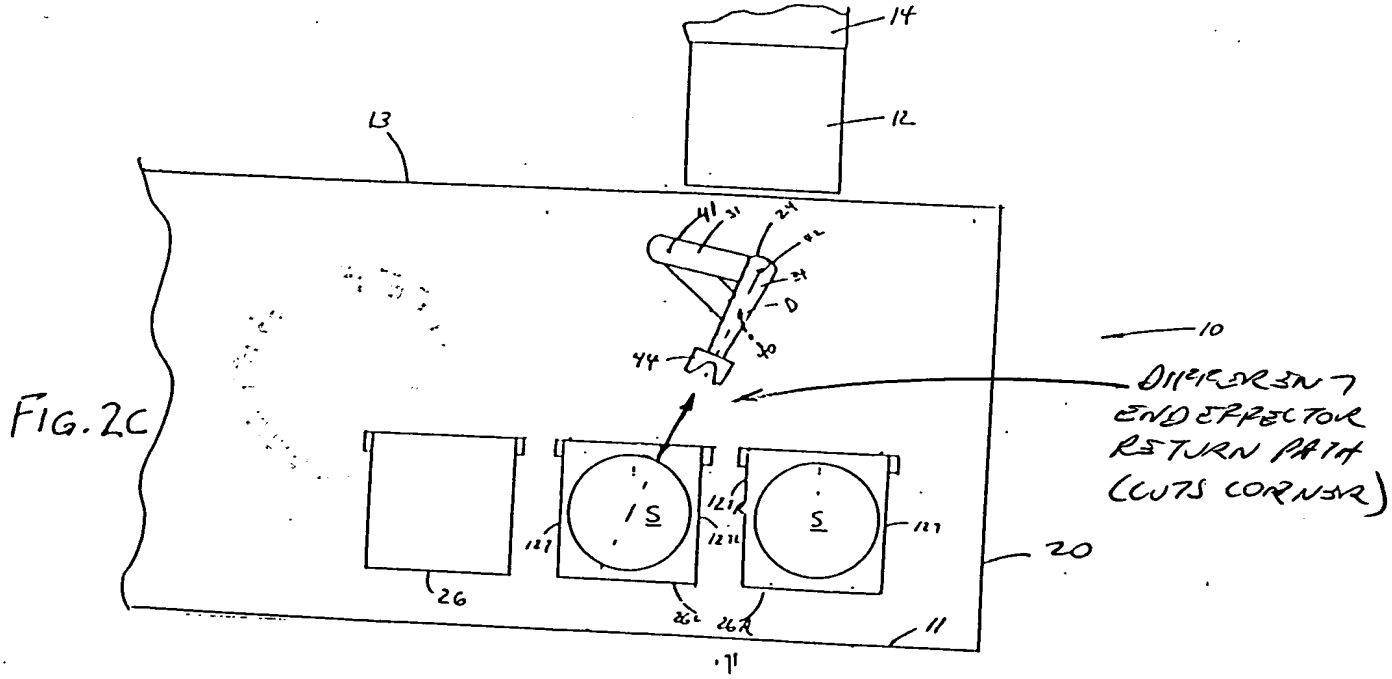

FIG. 3A

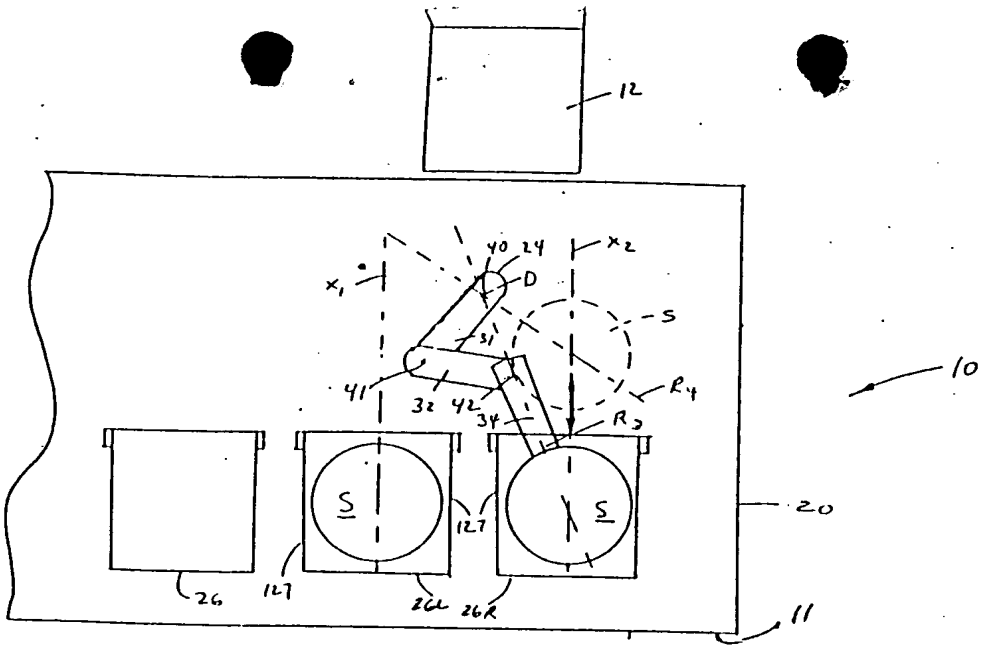

FIG. 3B

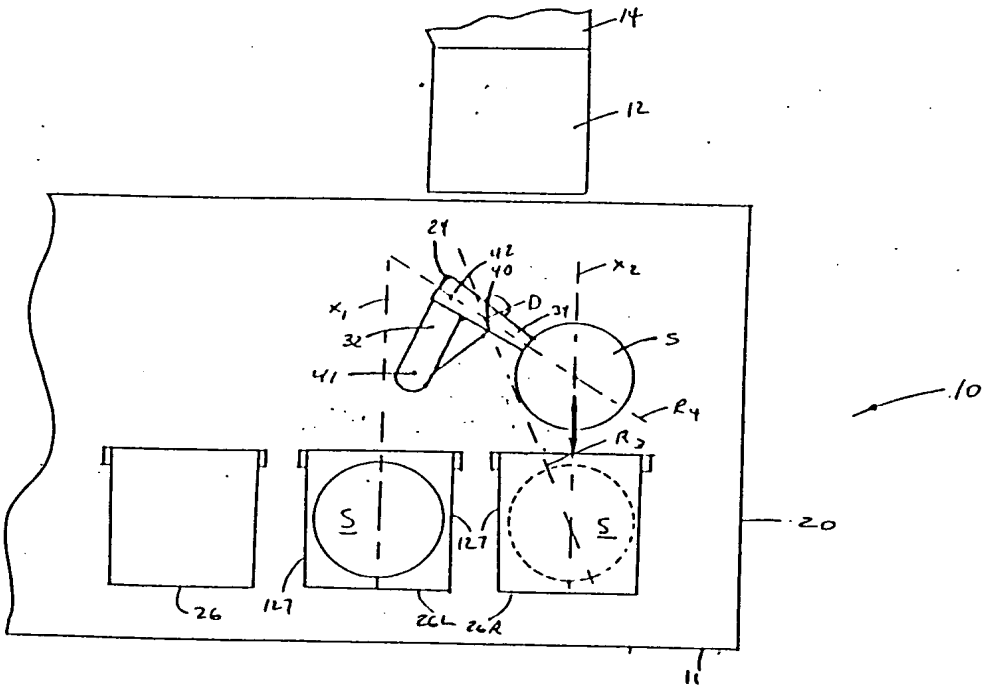

FIG. 3C